Claims

1.   A data updating system using differential data, comprising:

a differential data producing unit which has a plurality of versions of data for producing the differential data representing the difference between a

5   pre-updating file as one version of data and a post-updating file as another version of the data;

a communicating unit which transfers the differential data; and

a post-updating file restoring unit which receives the differential data, and restores the post-updating file based on the already stored pre-updating file

10   and the received differential data,

wherein the differential data includes Move data indicating zero, one, or a plurality of Move instructions to move and copy data from a part or all of the pre-updating file and Add data indicating zero, one, or a plurality of Add instructions to add and copy data in the differential data.

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2.   The data updating system according to claim 1, wherein the differential data is made of the Add data instead of the Move data when the length of the Move data is smaller than a prescribed threshold.

20   3.   The data updating system according to claim 1, wherein in the differential data, the Move data has data length information indicating the length of a data string to be copied and address information indicating the location of the data string to be copied; and

wherein at least one of the data length information and the address

25   information is made of a variable bit length.

4.   The data updating system according to claim 1, wherein in the differential data, the Move data has data length information indicating the length of a data string to be copied and address information indicating the location of the data string to be copied, a relative address for moving the data string being used as the address information, and

wherein when the same relative address value appears in a plurality of pieces of Move data, the one or more relative address values are expressed by one or more bits.

5.   A differential data producing device in a data updating system for producing differential data representing the difference between a pre-updating file as one version of data and a post-updating file as another version of the data, transferring the differential data to another location through a communication unit, and restoring the post-updating file based on the stored pre-updating file at the transfer destination and the differential data,

the differential data producing device, comprising:

a matching data string search unit which searches the pre-updating file for a data string which is matched with a data string in the post-updating file;

a Move/Add determining unit which determines whether to produce Move data or Add data as the differential data based on the search result, the Move data indicating a Move instruction to move and copy a matching data string from a part or all of the pre-updating file to the post-updating file, and the Add data indicating an Add instruction to add and copy a data string in the differential data to the post-updating file;

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a Move data output unit which outputs the Move data; and

an Add data output unit which outputs the Add data,

wherein the differential data has zero, one, or a plurality of pieces of the Move data and zero, one, or a plurality of pieces of the Add data.

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6.　　　The differential data producing device according to claim 5, wherein the Move data output unit includes a separator output unit for outputting a separator made of particular data indicating the beginning of the Move data; and

10　　　　　wherein data expressing the Move instruction is outputted after outputting of the separator.

7.　　　The differential data producing device according to claim 5, wherein when prescribed data used as the separator exists in the Add data, the Add

15　data output unit outputs prescribed data indicating that the prescribed data is not a separator following the data.

8.　　　The differential data producing device according to claim 5, wherein the Move/Add determining unit determines that the Move data unit outputs the

20　matching data string as the Move data when the length of the matching data string is equal to or greater than a prescribed threshold and that the Add data output unit outputs the matching data strings as the Add data when the length of the matching data string is smaller than the prescribed threshold.

25　9.　　　The differential data producing device according to claim 8, wherein

when the differential data producing device is used for a data updating system that transfers a program and data in a computing system using a 32-bit CPU, the threshold in the Move/Add determining unit is set to five bytes.

5   10.   The differential data producing device according to claim 8, wherein when the differential data between the pre-updating file as one version and the post-updating file as another version is produced, the differential data is produced by using a plurality of different thresholds as the threshold in the Move/Add determining unit; and

10   wherein the differential data having a minimum size is employed.

11.   The differential data producing device according to claim 5, wherein the Move/Add determining unit compares the sizes of differential data between when the matching data string is expressed by the Move data and when the

15   data string is expressed by the Add data, and determines that the data having a smaller size is to be selected.

12.   The differential data producing device according to claim 5, wherein the Move data output unit provides a data length continuation flag made of one

20   or more bits in the beginning byte or word of the Move data;

        wherein the length of the data string to be copied from the pre-updating file is expressed only by information in the byte or word when the data length continuation flag takes a prescribed first state; and

        wherein data length information is outputted when the data length

25   continuation flag takes a prescribed second state different from the first state,

the data length information indicating that information expressing the length of the data string continues in one or more bytes or words in or after the byte or word is continued.

5   13.   The differential data producing device according to claim 12, wherein the Move data output unit provides a data length continuation flag made of one or more bits in or after the second byte or word of the Move data;

wherein the length of the data string to be copied from the pre-updating file is expressed by information between the beginning byte or word of the Move data and the byte or word, when the data length continuation

10   flag takes the prescribed first state; and

wherein data length information is outputted when the data length continuation flag takes the prescribed second state different from the first state, the data length information indicating that information expressing the length of

15   the data string in one or more bytes or words in and after the byte or word is continued.

14.   The differential data producing device according to claim 5, wherein the Move data output unit outputs address information that uses an absolute

20   address in at least one of the pre-updating file and the post-updating file as information indicating a location for moving a data string to be copied from the pre-updating file to the post-updating file in the Move data.

15.   The differential data producing device according to claim 5, wherein

25   the Move data output unit outputs address information that uses a relative

address indicating the difference between the location of a data string in the pre-updating file and the location of the data string in the post-updating file as information indicating a location for moving the data string to be copied from the pre-updating file to the post-updating file.

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16.   The differential data producing device according to claim 5, wherein the Move data output unit and the Add data output unit produce and output the Move data and the Add data based on the order of data strings in the post-updating file; and

10   wherein the Move data output unit outputs address information that uses a relative address indicating the difference between the beginning location of a data string in the pre-updating file and the size of restored data in the post-updating file as information indicating a location for moving the data string to be copied from the pre-updating file to the post-updating file.

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17.   The differential data producing device according to claim 15 or 16, wherein the Move data output unit outputs an address continuation flag made of one or more bits in the beginning byte or word of the data string in the address information by the relative address in the Move data;

20   wherein the Move data output unit expresses the relative address only by the information in the byte or word when the address continuation flag takes a prescribed first state; and

wherein the Move data output unit outputs address information indicating that information that expresses the relative address continues in one

25   or more bytes or words in and after the byte or word when the address

continuation flag takes a prescribed second state different from the first state.

18. The differential data producing device according to claim 17, wherein the Move data output unit provides an address continuation flag made of one or more bits in and after the second byte or word in the data string in the address information by the relative address in the Move data; and

wherein the Move data output unit outputs address information indicating that information that expresses the relative address by information between the beginning byte or word of the data string in the address information and the byte or word when the address continuation flag takes the prescribed first state, and that expresses the relative address in one or more bytes or words in and after the byte or word when the address continuation flag takes the prescribed second state different from the first state.

19. The differential data producing device according to claim 15 or 16, wherein when the same relative address exists in a plurality of pieces of Move data in address information in the Move data, the Move data output unit expresses the one or more relative addresses by one or more bits in the beginning byte of word of the Move data.

20. The differential data producing device according to claim 5, wherein the Move data output unit outputs address information that uses a relative address indicating the difference between the location of the data string in the pre-updating file and the location of the data string in the post-updating file or the difference between the beginning location of the data string in the

pre-updating file and the size of restored data in the post-updating file as information representing the location of a data string to be copied from the pre-updating file to the post-updating file in the Move data;

wherein an address change flag made of one or more bits is provided in the Move data;

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wherein the Move data output unit outputs address information by the relative address following data length information indicating the length of the data string when the address change flag takes a prescribed first state; and

wherein the Move data output unit omits information expressing the relative address as the relative address in the previous Move data and the relative address in the present Move data are the same when the address change flag takes a prescribed second state different from the first state.

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21.   The differential data producing device according to any one of claims 15, 16, and 20, wherein the Move data output unit expresses the relative address in the address information in the Move data by the amount of change from the relative address in the previous Move data.

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22.   A differential data producing program enabling a computer to implement the functions of the unit in the differential data producing device in the data updating system according to any one of claims 5 to 21.

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23.   A post-updating file restoring device in a data updating system receiving differential data representing the difference between a pre-updating file as one version of data and a post-updating file as another version of the

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data and restoring the post-updating file based on the pre-updating file stored in the post-updating file restoring device and the differential data,

the post-updating file restoring device, comprising:

a Move/Add determining unit which determines whether the differential

5   data is Move data representing a Move instruction to move and copy a matching data string from a part or all of the pre-updating file to the post-updating file or Add data representing an Add instruction to add and copy a data string in the differential data to the post-updating file;

a Move data restoring unit which outputs a data string corresponding

10 to the Move data; and

an Add data restoring unit which outputs a data string corresponding to the Add data,

wherein the post-updating file is produced from the differential data.

15 24.   The post-updating file restoring device according to claim 23, wherein in the differential data, the Move/Add determining unit discriminates data expressing a Move instruction and provided after a separator made of particular data as the Move data and data expressing an Add instruction provided between the beginning of the differential data or the end of the previous Move

20 data and the presence of the separator as the Add data.

25.   The post-updating file restoring device according to claim 24, wherein when the separator is present in a data string and data following the separator is particular data in the differential data, the Move/Add determining unit

25 determines the separator as data present in the Add data, the data being used

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as a separator instead of the separator.

26.   The post-updating file restoring device according to claim 23, wherein the Move data restoring unit determines data length information provided in the Move data to determine the length of a data string to be copied from the pre-updating file to the post-updating file, and detects a data continuation flag made of one or more bits in the beginning byte or word of the Move data;

wherein when the data length continuation flag takes a prescribed first state, the data Move data restoring unit determines the data length information from information in the byte or word, and determines the length of the data string to be copied; and

wherein when the length of the data length continuation flag takes a prescribed second state different from the first state, the Move data restoring unit determines that the data length information continues in one or more bytes or words in and after the byte or word.

27.   The post-updating file restoring device according to claim 26, wherein the Move data restoring unit detects a data length continuation flag made of one or more bits in and after the second byte or word of the Move data;

wherein when the data length continuation flag takes the prescribed first state, the Move data restoring unit determines data length information from information between the beginning byte or word of the Move data and the byte or word; and

wherein when the data length continuation flag takes the prescribed second state different from the first state, the Move data restoring unit

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determines that the data length information continues in one or more bytes or words in and after the byte or word.

28.   The post-updating file restoring device according to claim 23, wherein the Move data restoring unit determines address information provided in the Move data, and determines a location for moving a data string is to be copied from the pre-updating file to the post-updating file; and

wherein the Move data restoring unit determines address information expressed by a relative address representing the difference between the location of the data string in the pre-updating file and the location of the data string in the post-updating file or the difference between the beginning location of the data string in the pre-updating file and the size of restored data in the post-updating file.

29.   The post-updating file restoring device according to claim 28, wherein the Move data restoring unit detects an address continuation flag made of one or more bits in the beginning byte or word in the data string in address information by the relative address in the Move data;

wherein the Move data restoring unit determines the address information of the relative address from information in the byte or word to determine the location of the data string to be copied when the address continuation flag takes the prescribed first state; and

wherein the Move data restoring unit determines that the address information continues in one or more bytes or words in and after the byte or word when the address continuation flag takes the prescribed second state

different from the first state.

30.   The post-updating file restoring device according to claim 29, wherein the Move data restoring unit detects an address continuation flag made of one or more bits in and after the second byte or word in the data string in the address information by the relative address in the Move data;

wherein the Move data restoring unit determines the address information of the relative address from the beginning byte or word of the data string in the address information or information in the byte or word to determine the location of the data string to be copied when the address continuation flag takes the prescribed first state; and

wherein the Move data restoring unit determines that the address information continues in one or more bytes or words in and after the byte or word when the continuation flag takes the prescribed second state different from the first state.

31.   The post-updating file restoring device according to claim 28, wherein the Move data restoring unit determines address information expressed by one or more bits in the Move data, and determines the location of the data string to be copied, one or more relative address values corresponding to the address information being the same relative address values.

32.   The post-updating file restoring device according to claim 28, wherein the Move data restoring unit detects an address change flag made of one or more bits in the Move data, and determines address information by the relative

address provided following data length information representing the length of the data string to be copied, when the address change flag takes a prescribed first state; and

wherein the Move data restoring unit determines the location of the data string to be copied using the same relative address as the relative address in the previous Move data when the address change flag takes a prescribed second state different from the first state.

33.   A post-updating file restoring program for enabling a computer to implement the functions of the units in the post updating file restoring device in the data updating system according to any one of claims 23 to 32.